CLAIMS

1. A switching power circuit comprising:

a switching unit provided with a plurality of switching devices and performing switching by turning ON and OFF a DC input voltage inputted;

a primary-side drive unit for performing switching driving so that said plurality of switching devices are alternately turned ON and OFF;

an insulated converter transformer for transmitting a switching output fed from said switching unit from the primary side to the secondary side, said insulated converter transformer including a primary winding, and a secondary winding having a center-tapped tap output, with a gap length set to be not less than a predetermined value to thereby set the coupling coefficient of said primary winding and said secondary winding to be not more than a predetermined value;

a primary-side resonance capacitor for forming a primary-side resonance circuit for causing the operation of said switching unit to be of a resonance type, at least by the leakage inductance component of said primary winding of said insulated converter transformer and its own capacitance; and

a synchronous rectification circuit having a secondary-side smoothing capacitor connected to the tap output of said secondary winding, for obtaining a secondary-side DC output voltage as an end-to-end voltage of said secondary-side smoothing capacitor by performing full-wave rectification of an alternating voltage induced in said secondary winding of said insulated converter transformer and charging said secondary-side smoothing capacitor with the rectified current; wherein

the numbers of turns of said primary winding and said secondary winding are so set that a secondary-side rectified current caused to flow in said synchronous rectification circuit by said full-wave rectification is in a continuous mode, irrespective of variations in the conditions of a load connected to said secondary-side DC output voltage; and

said synchronous rectification circuit comprises:

a first field effect transistor connected in series to a point between one of end portions divided by the tap output of said secondary winding and a secondary-side reference potential;

a second field effect transistor connected in series to a point between the other of said end portions divided by the tap output of said secondary winding and

said secondary-side reference potential;

a first drive circuit for outputting a gate voltage for turning ON said first field effect transistor by detecting, through a resistance device, a secondary winding voltage corresponding to the period of a half wave in which said first field effect transistor should flow a rectified current;

a second drive circuit for outputting a gate voltage for turning ON said second field effect transistor by detecting, through a resistance device, a secondary winding voltage corresponding to the period of a half wave in which said second field effect transistor should flow a rectified current; and, further,

a first inductor device having a required inductance inserted in series respectively between said one of said end portions divided by the tap output of said secondary winding and said first field effect transistor and between said other of said end portions divided by the tap output of said secondary winding and said secondary field effect transistor.

2. The switching power circuit as set forth in claim 1, comprising a second inductor device inserted in series between the tap output of said secondary winding and said smoothing capacitor.

3. The switching power circuit as set forth in claim 1, wherein said first inductor device is comprised of a tubular magnetic body through which to pass a lead wire for a drain electrode of said first or second field effect transistor.

4. The switching power circuit as set forth in claim 1, wherein said first inductor device is formed by making spiral a wiring pattern in a printed wiring board.

5. A switching power circuit comprising:

a switching unit provided with a plurality of switching devices and performing switching by turning ON and OFF a DC input voltage inputted;

a primary-side drive unit for performing switching driving so that said plurality of switching devices are alternately turned ON and OFF;

an insulated converter transformer for transmitting a switching output fed from said switching unit from the primary side to the secondary side, said insulated converter transformer including a primary winding, and a secondary winding having a center-tapped tap output, with a gap length set to be not less than a predetermined value to thereby set the coupling coefficient of said primary winding and said secondary winding to be not more than a predetermined value;

a primary-side resonance capacitor for forming a primary-side resonance circuit for causing the operation of said switching unit to be of a resonance type, at least by the leakage inductance component of said primary winding of said insulated converter transformer and its own capacitance; and

a synchronous rectification circuit having a secondary-side smoothing capacitor connected to the tap output of said secondary winding, for obtaining a secondary-side DC output voltage as an end-to-end voltage of said secondary-side smoothing capacitor by performing full-wave rectification of an alternating voltage induced in said secondary winding of said insulated converter transformer and charging said secondary-side smoothing capacitor with the rectified current; wherein

the numbers of turns of said primary winding and said secondary winding are so set that a secondary-side rectified current caused to flow in said synchronous rectification circuit by said full-wave rectification is in a continuous mode, irrespective of variations in the conditions of a load connected to said secondary-side DC output voltage; and

said synchronous rectification circuit comprises:

a first field effect transistor connected in series

to a point between one of end portions divided by the tap output of said secondary winding and a secondary-side reference potential;

a second field effect transistor connected in series to a point between the other of said end portions divided by the tap output of said secondary winding and said secondary-side reference potential;

a first drive circuit for outputting a gate voltage for turning ON said first field effect transistor by detecting, through a resistance device, a secondary winding voltage corresponding to the period of a half wave in which said first field effect transistor should flow a rectified current;

a second drive circuit for outputting a gate voltage for turning ON said second field effect transistor by detecting, through a resistance device, a secondary winding voltage corresponding to the period of a half wave in which said second field effect transistor should flow a rectified current; and, further,

an inductor device having a required inductance inserted in series between a tap output of said secondary winding unit and said smoothing capacitor.

6. The switching power circuit as set forth in claim 5, further comprising a constant-voltage control

unit for performing a constant-voltage control of said secondary-side DC output voltage by a variable control of the switching frequency of said switching unit according to the level of said secondary-side DC output voltage.

7. The switching power circuit as set forth in claim 1 or 5, further comprising a primary-side partial voltage resonance circuit composed of the capacitance of a partial resonance capacitor connected in parallel to at least one switching device of said plurality of switching devices constituting said switching unit, and the leakage inductance component of said primary winding of said insulated converter transformer, said primary-side partial voltage resonance circuit performing a partial voltage resonance operation in the period for which said one switching device is turned OFF.

8. The switching power circuit as set forth in claim 5, wherein said inductor device is a choke coil which is comprised of a flat plate-like ferrite core having a winding longitudinally wound into a hollow cylindrical form by use of a rectangular wire, and a pot-type metallic dust inserted in said hollow cylindrical winding, and which has a required saturation magnetic flux density and a required inductance.

9. The switching power circuit as set forth in

claim 5, wherein said inductor device is a choke coil which comprises a required number of turns of a winding on a magnetic leg of an EE type core formed of an Mn-Zn based ferrite and which has a required saturation magnetic flux density and a required inductance.

10. The switching power circuit as set forth in claim 9, wherein said winding of said choke coil is formed by winding a litz wire band formed by aligning a plurality of litz wires in parallel to each other into a band form.

11. The switching power circuit as set forth in claim 9, wherein said winding of said choke coil is formed by winding a plain weave wire formed by weaving a plurality of litz wires in plain weave.